tance before the contraction is able to show itself, then the latency of the part of the muscle where the shock is sent in should be little or nil; yet Yeo obtained nearly the typical latency under such circumstances. The author concludes that "the latency of the individual muscle elements is a theoretical speculation which appears difficult to determine by experimental methods, and which I feel disinclined to investigate. Graphically I think it cannot be shown to be shorter than that observed at the actual point of stimulation—*i. e.* nearly .005″."

What is wanted is plainly more work, and such work as will fill up the gaps in the researches now extant. Thus, to mention some of the more obvious defects, Gad does little more than state his results; Tigerstedt, generally very satisfactory and explicit, fails to give the name of the muscle used by him, although it is known that the degree of regularity of form of the muscle is of considerable importance; and Yeo, while finding fault with Tigerstedt for employing hypermaximal and injurious stimuli, seems possibly himself at times to have made use of submaximal shocks.

It is interesting to compare the various numerical values of the latent period found from time to time by different observers. The excellent table of Yeo is used as a basis for the following:

1850.	Helmholtz,	.01″	1877.	Lautenbach,	.008″
1859.	Harless,	.0187		Brücke,	.007
	Bezold,	.0136		Gad,	.004
	Wundt,	.01	1879.	Sewall,	.01
1862.	Fick,	.007		Richet,	.008
1867.	Place,	.005		Langendorf,	.009
1868.	Marey,	.01		Mendelssohn,	.008
	Klunder and Hensen,	.0085	1883.	Cash and Yeo,	.009
	Lamansky,	.0075		Rosenthal,	.009
1870.	Volkmann,	.01	1885.	Fredericq,	.018
1871.	Valentine,	.021		Tigerstedt,	.005
	Bernstein,	.0188	1888.	Regéczy,	.0033
1874.	Ranvier,	.015		Yeo,	.0065

EDW. C. APPLEGARTH.

Die Theorie der Muskelcontraktion. G. E. MÜLLER. Nachrichten von der Königlichen Gesellschaft der Wissenschaften und der Georg-Augusts-Universität zu Göttingen, No. 7, March, 1889.

As the whole question of the latent period is intimately connected with the obscure problem of muscle contraction, perhaps the elaborate theory of contraction recently formulated by Müller may be of interest here.

This author, discarding the views of Krause, Merkel, and Engelmann, starts out with three fundamental, constituent elements of the muscle fiber, which he designates *disdiaklasten*, *gerüstsubstanz*, and *muskelsaft*. The disdiaklasts (Brücke's term for the doubly refracting particles of the muscle) are here elongated aggregates of such particles or micellae, so arranged that their long axes are parallel to that of the fiber. Running from one end of the fiber to the other there are series of cross columns of these disdiaklasts at the level of the anisotropic bands, the individual disdiaklasts of each column being united laterally with their neighbors by little crosswise rods or threads (*querbälkchen*) forming a network, and longi-

tudinally, that is across the isotropic bands, with the corresponding disdiaklasts of the succeeding cross column by somewhat similar little rods of lengthwise disposition (*längsbälkchen*). The series of disdiaklasts so joined together by the *längsbälkchen* are the fibrils, and these together with the network of *querbälkchen* constitute the *gerüstsubstanz*. All the remaining space within the sarcolemma is filled with *muskelsaft* or muscle plasma, and it is in this substance that the heat production takes place during activity of the muscle.

He supposes that contraction is some such process as this. By anabolism, a store of energy is laid up, which is partly converted into heat upon stimulation of the muscle. Owing to their nature and form considered crystallographically, the disdiaklasts are pyro-electric, and from their arrangement in the fiber the neighboring ends of the disdiaklasts of consecutive cross columns will contain electricity of opposite signs, the effect of which will be to pull the elements from a longitudinal to a transverse position. This tendency, however, will be resisted chiefly by the *gerüstsubstanz*, but also by the sarcolemma, the perimysium, etc. To the opposition so engendered he applies the name *inner-contraction-resistance*. The cross and lengthwise rods differ in structure microscopically. The lengthwise rods are firmer and less capable of swelling than the crosswise rods, which are full of so-called *functional pores*, whose duty it is to absorb the surrounding plasma. When the crosswise rods are stretched lengthwise, as is the case when the disdiaklasts are forced into their transverse position, their capacity for the plasma is increased, so that the muscle on contracting shortens and swells, not simply on account of the change of position, but also because the *querbälkchen* become very turgid. Now when the electric charge of the disdiaklasts sinks to a certain limit, the retention of plasma, in consequence, is discontinued, but the process of expulsion is comparatively slow, due to inadequate elasticity. The return of the disdiaklasts to their normal position being thus retarded, the relaxation is somewhat prolonged.

He puts great stress upon the following myothermal law, which is conceived to be fundamental: "The heat production which takes place in consequence of a given stimulus in a particular part of the plasma, is so much less, the higher the pressure is, under which this part of the plasma is." Indeed, as much depends upon the plasma as upon the electric charge of the disdiaklasts. Thus to make an application, he says, the tension which a muscle possesses at any given time depends not simply upon the electric charge then present, and upon the length of the muscle at that moment, but also upon the value of the *functional imbibition pressure*, or the pressure which the plasma in the functional pores supports. Again, when products of muscle activity accumulate, they increase the consistency of the plasma, which then opposes any change of form of the muscle, and at the same time lessens the rate of transmission of the excitation. The advantage of the circulation is, then, in maintaining the low consistency. In another place, speaking of the plasma, he says, through every stimulation the irritable material, or the quantity of the irritable molecules of the plasma, through whose decomposition the production of heat is effected, is lessened according to the measure of intensity of the excitation. This serves naturally to weaken the influence of the following stimulus.

Müller applies his theory very deftly, and the whole thing

possesses a degree of plausibility, but still there are no facts as yet to substantiate it, and in the absence of these it is well to await developments, especially as he gives this paper simply as a preliminary communication. E. C. A.

III.—ABNORMAL.

A FEW PRACTICAL SUGGESTIONS TO PHYSICIANS IN ASYLUMS, HOSPITALS, ETC., FOR THE OBSERVATION OF PATIENTS SUFFERING FROM MENTAL OR NERVOUS DISEASE.

I.

The following suggestions are made with the view to getting data beyond those strictly necessary for diagnosis, since such data would be extremely valuable both from the psychological standpoint and as a basis for determining the function of diseased parts, should the case come to autopsy.

How to observe.—Patient should be away from all distractions, in a room apart, and at ease—as a rule, either sitting or lying down, and with the mind placid. Experiments should rarely last an hour, as the attention is easily fatigued. Successive observations should be made at the same time of day. For experiments not involving the eyes it is best to have the patient thoroughly blindfolded.

Records.—May be written, or in some cases, *e. g.* areas of anaesthesia, plotted on an outline of the body, such as may be copied from any anatomy.

In progressive disease, a careful study of one patient has more value than a casual study of several.

Beginning with the skin sensations.—Is the sense of contact anywhere absent? Where? If present, test "discriminative sensibility" with compasses. For a table of the normal discriminations in various regions see Foster's *Text-book of Physiology* under "Tactile Sensations." Compasses should be made of a substance non-conductive of heat, and slightly blunted at the points, like the rounded end of a small needle. The best form is that where one point is fixed and the other slides along an arm (at right angles to the first point) on which a scale is marked so that the distance between the points is easily read off. See *Aesthesiometer*, by J. Jastrow, AMERICAN JOURNAL OF PSYCHOLOGY, Vol. I, p. 552.

Sense of location.—The patient to touch a spot on his body which the observer is touching.

Temperature sense.—Discrimination of differences. Two objects—preferably thermometers with large bulbs—the temperature of which is known, are touched successively to the same spot on the body and the patient required to distinguish between them.

Sensibility to heat and cold.—Test by applying metal points suitably warmed or cooled. If these sensations are dull, the area stimulated must often be large, a square inch or more, to get any reaction at all. Refer to *Eine neue Methode der Temperatursinnprüfung*, Dr. A. Goldscheider, Archiv für Psychiatrie und Nervenkrankheiten, Bd. XVIII, Heft 3, 1887. *Research on the Temperature-sense*, H. H. Donaldson, Mind, No. XXXIX, 1885.

Those cases in which the sensation for one sort of temperature stimulus remains while that for the other is absent, are specially important.